OPINION

by Prof. Dr. Silvia Trifonova Trifonova-Pramatarova, University of National and World Economy (UNWE), Sofia

of a dissertation for awarding the educational and scientific degree “doctor” in the Area of higher education 3. Social, Economic and Legal Sciences, Professional field 3.8 Economics, PhD program “Finance, Insurance and Social Insurance”, University of Insurance and Finance, Sofia

Author: PhD student Anna Małgorzata Jatczak

Topic: “Application of mathematical models in banking in Poland”

1. General description of the presented materials

By Order No. 297/51.06.2026 of the rector of the University of Insurance and Finance, corresponding member Prof. DSc. of Law Boris Velchev, I have been appointed as a member of the scientific jury to ensure the procedure for the defense of a dissertation on “Application of mathematical models in banking in Poland” for the acquisition of the educational and scientific degree “doctor” in the Area of higher education 3. Social, Economic and Legal Sciences, Professional field 3.8 Economics, PhD program “Finance, Insurance and Social insurance”. The author of the dissertation is Anna Jatczak. The scientific supervisor is Prof. DSc. Igor Britchenko.

By decision of the scientific jury at its first meeting, I have been appointed to prepare an opinion on the candidate’s work within the framework of this procedure.

The materials submitted by the University of Insurance and Finance include all necessary documents for the procedure, namely: dissertation in Russian, abstract in English, abstract in Bulgarian list of publications, the publications on the dissertation, declaration for fulfilment of the national minimum requirements for obtaining a doctoral degree in professional field 3.8 Economics, declaration of authenticity and originality, scientific jury order, full report from the electronic plagiarism checking system StrilePlagiarism.com. The doctoral student did not present an independent reference to the contributions. The contributions are indicated in the abstract.

This gives me reason to state that the regulatory requirements for admitting doctoral student Anna Jatczak to participate in the procedure for defending a dissertation for the award of the educational and scientific “doctor” have been met.

2. Relevance of the topic and relevance of the goals and objectives

The topic of Anna Jatczak’s dissertation is very relevant and significant for the development of banking systems. All banks use mathematical models in their work every day. The aim of the dissertation is to demonstrate the key role that mathematical modeling plays in the modern banking world using the example of two commercial banks in Poland. In this regard, the work examines the potential for improving the efficiency of banks' deposit and lending activities through the use of mathematical models.

3. Knowledge of the problem

The PhD student is well acquainted with the problem of the dissertation research. The following hypotheses of the work are formulated: Main hypothesis: Mathematical models are of crucial importance for banking operations. Detailed (working) hypothesis: The use of mathematical models significantly improves the efficiency of banking operations. The formulated hypotheses are tested on the basis of a thorough empirical analysis of the financial ratios of two selected Polish banks in relation to interest rates and inflation processes over a certain time period. However, the subject and object of the research are not clearly formulated in the dissertation work.

4. Research methodology

The dissertation work is of a theoretical and empirical nature. To achieve the purpose of the work and to verify the hypotheses, various research methods were used: theoretical and methodological analysis, historical approach, comparative analysis, review of literary sources on the research topic, descriptive analysis, method of analysis and synthesis, method of induction and deduction, statistical analysis, simulation, coefficient analysis, graphical and tabular analysis, etc.

The efficiency of two Polish banks was studied: SANBank – Nadsanska Cooperative Bank in Stalowa Wola, for which a financial analysis was applied for the period 2017-2023, and Bank Pekao S.A. – Bank Pekao AD for the period 2017-2025. The coefficient analysis of banking efficiency is expressed in tracking return on assets (ROA), interest margin, costs/income, return on equity (ROE), net interest income, net income from fees and commissions and operating expenses.

The work also examines the relationship between inflation and the interest rates of the Monetary Policy Committee (MPC) in Poland in the period 2010-2022, with a particular focus on the years 2020-2025. The relationship between the average interest rate on loans and deposits in Poland in 2020-2022 and inflation is examined by analyzing the numerical values published by the National Bank of Poland in the statistics of interest rates and inflation indices during the period under review. Changes in the value of bank capital due to inflation between 2010 and 2025 in Poland are studied using mathematical models. The study of real interest rates on deposits and loans from 2010 to 2022 is carried out using the Irving Fisher formula.

It is noteworthy that a different time period is used throughout the work, which makes it difficult to compare the results.

5. Characteristics and evaluation of the dissertation

Anna Jatczak’s dissertation has a total volume of 167 pages. The exposition consists of an introduction, the main text in 3 chapters, a conclusion and a bibliography. The bibliography of the dissertation includes a total of 78 literary sources, 8 regulatory acts and 9 Internet sources. There is no list of abbreviations used, as well as a list of tables, graphs and figures in the work.

The dissertation contains numerous tables, graphs and figures to illustrate the author's theses and statements.

The first chapter of the work is devoted to the theoretical aspects of the use of mathematical models in banking. Here, the structure of the banking system in Poland and its characteristics, as well as the types of mathematical models in banking, are presented in a very descriptive manner.

The second chapter of the work is devoted to the financial analysis of the activities of two selected Polish banks: SANBank – Nadszanska Cooperative Bank in Stalowa Wola, for which a financial analysis was applied for the period 2017-2023, and Bank Pekao S.A. – Banka Pekao AD, for which the analysis concerns the period 2017-2025. It is not clear why a different time period was studied for these two banks. Here, the main trends and changes in the financial condition of these two Polish banks are outlined, with an emphasis on the problems of their efficiency.

The third chapter of the dissertation is devoted to the study of the practical application of mathematical models to improve banking efficiency in Poland. This chapter has two subsections: mathematical models and their practical application in banking; impact of the use of mathematical models in banking on improving banking efficiency in Poland. The focus is on the credit and deposit activity of banks, in connection with which the interest rates on bank loans and deposits and the reference interest rates of the Monetary Policy Council of the National Bank of Poland are examined, and their relationship with inflation in Poland. This article presents the results of a study of real interest rates on deposits and loans in Poland from 2010 to 2022. The main conclusions of the study are summarized in the Conclusion of the work.

6. Scientific contributions and significance of research results for science and practice

The contributions of Anna Jatczak's dissertation are not stated in the work, but are presented in the abstract as research results. The contributions are not tied to the confirmation or rejection of the research hypotheses. In my opinion, the dissertation has the following two contributions:

1. Enrichment of existing knowledge about the Polish banking system, its structure and efficiency using the example of the two studied Polish commercial banks.
2. Enrichment of existing knowledge about interest rates on bank loans and deposits and the reference interest rates of the Monetary Policy Council of the National Bank of Poland, and their relationship with inflation in Poland.

7. Evaluation of the publications on the dissertation

The doctoral student has presented 3 scientific publications on the topic of the dissertation, which are entirely in the form of articles in the journal of the University of Insurance and Finance – VUZF Review. All three publications are independent.

8. Assessment of compliance with national minimum requirements

The reference on the fulfilment of the minimum national requirements for acquiring educational and scientific degree “doctor” in professional field 3.8 Economics shows that the publications submitted by the PhD student form 80 points.

9. Personal participation of the candidate

I believe that the dissertation is the work of the doctoral student herself.

10. Abstract

The abstract in Bulgarian has a total length of 11 pages and corresponds to the structure and content of the dissertation.

11. Critical remarks, questions and recommendations

I have the following critical comments and recommendations for Anna Jatczak’s dissertation:

1. The work does not clearly formulate the subject and object of the study. There are also no formulated research tasks.
2. A serious drawback is that the research period is not unified throughout the dissertation work. Almost all the researched indicators are calculated for different periods. Moreover, no argumentation is given as to why these different research periods were chosen.
3. There is no need to highlight as some significant result of the work that the concepts of nominal capital value and real capital value represent, respectively, the actual values of capital and the values after eliminating inflation, and that their measures are the interest rates: nominal and real. This is a generally recognized and well-known financial interpretation, which is known even to students.
4. There are errors in the translation of the abstract into Bulgarian. In many places the dissertation work is written as an article.
5. There are no clearly highlighted contributions of the work. The abstract formulates very generally the results of the work, presented in a descriptive and narrative form. It is not stated whether the study’s hypotheses are confirmed or rejected.

CONCLUSION

The dissertation on the topic “Application of mathematical models in banking in Poland”, authored by Anna Jatczak, is an in-depth study of this issue. The presented materials are in accordance with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (LASRB) and the Ordinance on the Implementation of the LASRB, as well as the Ordinance on Admission and Training of Doctoral Students at the University of Insurance and Finance.

Based on this, I give a positive assessment of the scientific research presented in the above-mentioned peer-reviewed dissertation and abstract, and I propose to the respected members of the scientific jury to award Anna Jatczak the educational and scientific degree “doctor” in the Area of higher education

3. Social, Economic and Legal Sciences, professional field 3.8 Economics, doctoral program “Finance, Insurance and Social Insurance”, University of Insurance and Finance, Sofia.

28.07.2026 Author of opinion: ……………

Sofia (Prof. Silvia Trifonova-Pramatarova, PhD)